



Nebraska Public Power District

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August 24, 2011

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Subject: NPPD Transmittal286 – District Comments on Sargent & Lundy Submittal NPPD-SL-0293 – FGD Process Water Balance

References:

1. Sargent & Lundy Transmittal NPPD-SL-0293 and NPPD-SL-0251
2. Sargent & Lundy Action Items 11-0451

Paul:

Attachment A to NPPD Transmittal 286 contains GGS MPCE team member comments on S&L's submittal NPPD-SL-0293 - FGD Process Water Balance.

Please have appropriate Sargent & Lundy personnel address the comments and resubmit this white paper by September 15, 2011. To ensure that all items noted in this letter have been properly addressed to the satisfaction of the GGS MPCE team, please provide a specific response and comments to each question on how Sargent & Lundy has addressed each issue. Attachment A is being provided in *Word* format for this purpose.

Please contact me at 308-386-5312 or via e-mail at bbnitsc@nppd.com with any questions or comments concerning the requested actions.

Bob Nitsch ^{lmh}

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Engineer

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Attachment

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T:\MPCE\PROJECT FILES\01.13 S&L ENGINEERING SERVICES AGREEMENT 4700000926\01.13.10 SUBMITTAL FORMS TO
S&L\#286 LETTER 110815 - COMMENTS ON NPPD-SL-0293- FGD PROCESS WATER BALANCE.DOCX

**SARGENT & LUNDY SUBMITTAL
NPPD-SL-0293**

ATTACHMENT A

Based on review of Sargent & Lundy submittal NPPD-SL-0293 – FGD Process Water Balance, GGS MPCE team members have the following comments and request that S&L address them in a follow-up revision to this document by September 15, 2011:

1. Please add a section to the FGD Process Water Balance sheet that lists the design inputs (e.g., Fuel Type, Chlorine in fuel level, and Percent Sulfur in Fuel Level) for the listed water balance. See attached.
2. Please build a spreadsheet and include it with this white paper that lays out the predicted water streams for all three evaluated sulfur in fuel levels (i.e. 0.28%, 0.7%, and 1.0%), and percent of chlorine in fuel levels (i.e. 0.02%, 0.01%, and 0.005%) used previously in the FGD process water analysis based on a 30,000 ppm chlorine level in the absorber. See attached. The predicted streams were also evaluated for a lower Cl content in the makeup water based on a more typical level as shown in item 5 below. The 0.02% level was not included since it is very unlikely, if at all possible that the chlorine content will reach this level. All of the fuel analyses received from NPPD show Cl at 100 ppm or less.
3. Please add a section to the FGD Process Water Balance sheet titled “Predicted Absorber Chloride Level (ppm) Zero Liquid Blowdown Discharge Point” that lists the required chloride ppm level in the absorber to achieve a zero design blowdown rate. This section should be set up in a similar manner to the table requested in Item 2 above by denoting the various design inputs (e.g., Fuel Type, Chlorine in fuel level, and Percent Sulfur in Fuel Level). This spreadsheet should denote the predicted zero liquid blowdown discharge point for all three evaluated sulfur in fuel levels and percent of chlorine in fuel levels used in prior FGD analysis based on a 30,000 ppm chlorine level in the absorber. See attached.
4. Based on recent discussions with other MPCE / FGD vendors, a concern has been raised on the large impact / effect bromine levels may have on the allowable chloride levels in the absorber. Issues such as using brominated activated carbon or brominated treatment processes on the incoming coal feed to the boiler for mercury control are issues that were identified where another MPCE process could impact downstream FGD performance. What has Sargent & Lundy observed and noted to date in regard to FGD impacts concerning FGD bromine levels and the use of brominated products / processes upstream of the FGD absorber vessel? In halogenated activated carbon, the bromine molecule is

impregnated in the carbon particle and will not release itself in the FGD. If a fuel additive is used in conjunction with activated carbon there could be an issue, however there is not a lot of data to support that the equilibrium chloride concentration in the FGD would be impacted.

5. Based on the discussions held on August 16, 2011 at Sargent & Lundy's offices in Chicago, additional limited testing was completed on the chlorine content of the potable ground water supply for the plant. Results of this additional testing were:
 - a. Potable Well No. 3: Tested on August 19, 2011
 - i. Cl = 33.0 ppm, SO₄ = 207.1 ppm, and NO₃ = 3.0 ppm
 - b. Potable Well No. 2: Tested on August 23, 2011
 - i. Cl = 33.4 ppm, SO₄ = 229.7 ppm, and NO₃ = 1.4 ppm
6. Based on the discussions held on August 16, 2011 at Sargent & Lundy's offices in Chicago, it appears that there would be an envelope of potential blowdown rates based on the potential variation in the sulfur and chlorine content of the coal and the chlorine content of the makeup water used in the overall combustion and WFGD processes. Based on the information received during this discussion this blowdown operating envelope appears to range from 0 gpm / unit up to 6 gpm / unit.

It is noted that Sargent & Lundy has previously asked what the District is looking for to address a prior District request to evaluate the impact of potential WFGD waste streams with the plant's existing site water balance. In response to this question, the District is requesting appropriate Sargent & Lundy personnel to evaluate the potential envelope of WFGD waste streams and determine viable action plans to handle and address this range of flows in an environmentally acceptable manner based on current and foreseen future environmental regulations regarding this issue.

The District currently sees the proper addressing of this process issue as an unresolved item that has not been fully vetted and evaluated to a final solution for a potential WFGD process at GGS. The District wants viable and workable designs, along with potential new equipment or existing equipment modification options identified and appropriately addressed in this part of the planning phase. This is requested so the potential needs and issues involved with addressing this process issue at the plant site can be fully understood. Based on these issues, the District is requesting Sargent & Lundy to develop cost and design options for a low, medium, and high WFGD blowdown flow treatment plan. Based on

discussions to date, these design options may include but not be limited to the following:

- a. Low Blowdown Rate(S&L to specify design range): Handle FGD blowdown flow via the gypsum disposal process and coal selection to keep blowdown flow rates to as close to zero as possible. Under this option, no other equipment would be installed to handle FGD blowdown water flows such as wastewater treatment, zero liquid discharge, tank storage, or fly ash / gypsum mixing equipment.
 - b. Medium Blowdown Rate (S&L to specify design range): Modify as needed the GGS Fly Ash Damp Unloader equipment and related processes to dispose of blowdown water with landfilled fly ash. Also, install new or modify existing on-site storage tanks to provide surge and storage capacity for the WFGD blowdown streams.Under this option, no other equipment related to processes such as wastewater treatment or zero liquid discharge would be installed to handle the FGD blowdown water flows.
 - c. High Blowdown Rate (S&L to specify design range): Modify as needed the GGS fly ash damp unloader equipment and related processes to dispose of blowdown water with landfilled fly ash. Also, install new or modify existing on-site storage tanks to provide surge and storage capacity for the WFGD blowdown streams.Finally, also install wastewater treatment and zero liquid discharge process equipment to handle any blowdown flows that cannot be handled with the fly ash damp unloading process.
7. In conjunction with this request and in light of prior discussions on this topic and the prior options outlined in Sargent & Lundy submittal NPPD-SL-0251, the question is also asked again whether existing GGS assets and processes can be modified and adjusted to handle the potential WFGD blowdown streams. Specifically, based on the previous S&L submittal, NPPD-SL-0251, and considering the potential revised WFGD water balance based on a 30,000 ppm chloride level, the District requests that appropriate S&L personnel revisit Treatment Disposal Option 1 – Recycle to Damp Fly Ash Unloading System that was described in this submittal to address the medium blowdown rate scenario covered in Item 6.b above.

Based on the review of the information supplied, it appears to District personnel that the use of the fly ash damp unloading process at GGS may have the potential to adequately handle and utilize the FGD blowdown waste streams if certain modifications (i.e. coatings for example) were installed in them. It also appears that some or all of the four (4) existing abandoned in place hydrobins

and appurtenant surrounding pipe racks currently located on the plant site may also lend themselves to a temporary FGD blowdown storage tank(s) option if certain modifications (i.e. coatings, minor piping modifications) were applied to them. The existing hydrobins also appear to be located and installed at a judicious elevation and location compared to the GGS fly ash storage silos. This comment is made from the perspective that the elevation of the bottom of a potential discharge point from these hydrobins, compared to the installed elevation of the GGS fly ash damp unloaders located in the fly ash silos, would lend itself to the flow of the hydrobin contained WFGD blowdown to the GGS damp unloaders via gravity or a minimal sized pumping system.

If the use of these existing plant assets and ideas to address this FGD process issue are not viable based on Sargent & Lundy's experience, then the District needs to know why and for what reasons. If the use of the proposed existing plant assets do appear to lend themselves to addressing this issue, then the costs to implement the proposed plan to handle this blowdown flow need to be included in the predicted WFGD system costs.

To assist Sargent & Lundy personnel with this effort, the following drawings can be viewed on the enclosed CD with this letter.

GGS Unit 1 & 2 Hydro Bin / Dewatering Bin Drawings

- a. 433024575 - Hydrobin Flow
- b. 433034430 - Hydrobin & Silo
- c. 434024596 - Hydrobin Drain Piping
- d. 434037531 - Hydrobin Control System
- e. 442077682 - Dewatering Bin Foundation
- f. 443111437 - Dewatering Bin Platforms & Ladders
- g. 443111439 - Dewatering Bin Grating
- h. 444079646 - Dewatering Bin Inside Dia.
- i. 444079647 - Dewatering Bin Inside Diameter
- j. 444079648 - Dewatering Bin
- k. 444083471 - Hydrobin Piping
- l. Unit 1 P6-138

- m. Unit 1 P6-139
- n. Unit 1 P6-139B
- o. Unit 1 P6-139C
- p. Unit 2 P6-19
- q. Unit 2 P6-20
- r. Unit 2 P6-21B

GGs Unit 1 & 2 Fly Ash Damp Unloaders

- a. ZD-01277-000 Rev. D – Piping & Instrumentation Diagram Dustmaster 200 TPH Series II
- b. ZD-01283-000 Rev. C – General Arrangement Dustmaster Model 200 TPH Series II Sheet 1 of 7
- c. ZD-01283-000 Rev. C – General Arrangement Dustmaster Model 200 TPH Series II Sheet 2 of 7
- d. ZD-01283-000 Rev. C – General Arrangement Dustmaster Model 200 TPH Series II Sheet 3 of 7
- e. ZD-01283-000 Rev. C – General Arrangement Dustmaster Model 200 TPH Series II Sheet 4 of 7
- f. ZD-00875-100 – Rubber Liner Assembly
- g. ZF-04046-100 – Rotating Case Assembly Model 300 / 450 Turbin Mixer
- h. ZF-04177-100 – Slide Door Assembly Turbin 300 / 450 Dustmaster 120 TPH / 200 TPH
- i. ZD-01318-000 Rev. E. – General Arrangement Dustmaster Model 200 TPH S-II
- j. M0044679 - GGS Unit #2 Fly Ash Silo Damp Unloader Floor Plan El. 3152'-6"
- k. Dustmaster Operating & Maintenance Manual